

**Toshiba Field Programmable Gate Array (FPGA)
Based Safety Related I&C Platform**

Submitting an Updated Topical Report

July 27th 2012
Phone conference

Toshiba Corporation
Instrumentation & Control Systems Design and Engineering Department
Isogo Nuclear Engineering Center

Agenda

- 9:00 am - 9:05 am Introductions/Opening Remarks
- 9:05 am - 10:00 am Presentation and discussion on outline of updated TR

Adjourn

Personnel

- Robert Schrauder TANE Licensing VP
- Akira Fukumoto Toshiba Senior Fellow
- Naotaka Oda Toshiba Control System Group Manager
- Toshifumi Hayashi Toshiba Control System Group Chief Specialist
- Toshiaki Itoh Toshiba Instrumentation Sys. Group Chief Specialist
- Tadashi Miyazaki Toshiba Instrumentation Sys. Group Specialist
- Shigeru Suzuki TANE Senior VP
- David Herrell MPR Associates
- Craig Swanner MPR Associates

Meeting Objectives

- Discuss Toshiba responses to the NRC concerns on the submitted Topical Report that were provided in June 19 meeting.
- Discuss the actions and schedule to proceed

Background

- In June 19 meeting, NRC stated that Toshiba topical report (TR) was incomplete and indicated potential issues for their acceptance and options following the meeting.
- Toshiba selected to withdraw and resubmit updated topical report from the options. Official letter number is TOS-CR-FPG-2012-0001.

Response to NRC's Concern (1/4)

■ NRC concern:

- Proprietary Information
 - NRR Office Instruction LIC-500 “Processing Requests for Reviews of TRs”, ML091520370 Public
 - Section 4.2.5 states “The minimum possible amount of information should be designated as proprietary.”
 - The staff finds that approximately > 80% of the TR is marked proprietary.

■ Toshiba Response:

1. Toshiba will update the topical report to make most of it non-proprietary.
2. Confidential information including organization will be still proprietary.

Response to NRC's Concern (2/4)

■ NRC concern:

- Completeness of Scope
 - NRR Office Instruction LIC-109 "Processing Requests for Reviews of TRs" ML091810088
 - Section 3.1.2 states "Determine if there are significant analyses or evaluations missing..."
 - Staff found that the TR does not fully support the application for a generic safety system. TR needs to include:
 - Clear list of qualified HW
 - Better definition of generic system limitations and interconnection of the qualified HW
 - Clear description or analysis of how referenced application specific documentation supports the broader system.

■ Toshiba Response:

1. Toshiba will provide a non-proprietary list of modules (PC boards) with versions in the Application Guide.
2. Toshiba will provide a non-proprietary definitions of generic system limitations and how the qualified hardware is connected and communicates by figures of module configuration
3. Toshiba will provide a non-proprietary tables and figures that include module configuration.

Response to NRC's Concern (3/4)

■ NRC concern:

- Referencing unapproved topical reports
 - NRR Office Instruction LIC-109 "Processing Requests for Reviews of TRs" ML091810088
 - Section 3.1.2 states "A licensee's use of unapproved codes or TRs (or the use of codes and TRs outside the limitations imposed by the NRC staff) may be acceptable if the licensee or applicant has provided a full analysis to justify that the proposed use satisfies NRC regulations and is appropriately conservative."
 - Staff found many direct references that appear to not be clearly substantiated with regard to generic application.
 - Ex. HW architecture description from PRM TR
 - Ex. EPRI –TR 107330 compliance matrix makes multiple references to PRM documents with no justification for applicability to the broader system.

■ Toshiba Response:

1. Toshiba will update the topical report by removal of the references to the G-TR, S-TR, and Technical Report.
2. Toshiba will update the list of codes and standards
3. Toshiba will replace the references to the PRM documents in the appendices, replacing them with more descriptive text

Response to NRC's Concern (4/4)

■ NRC concern:

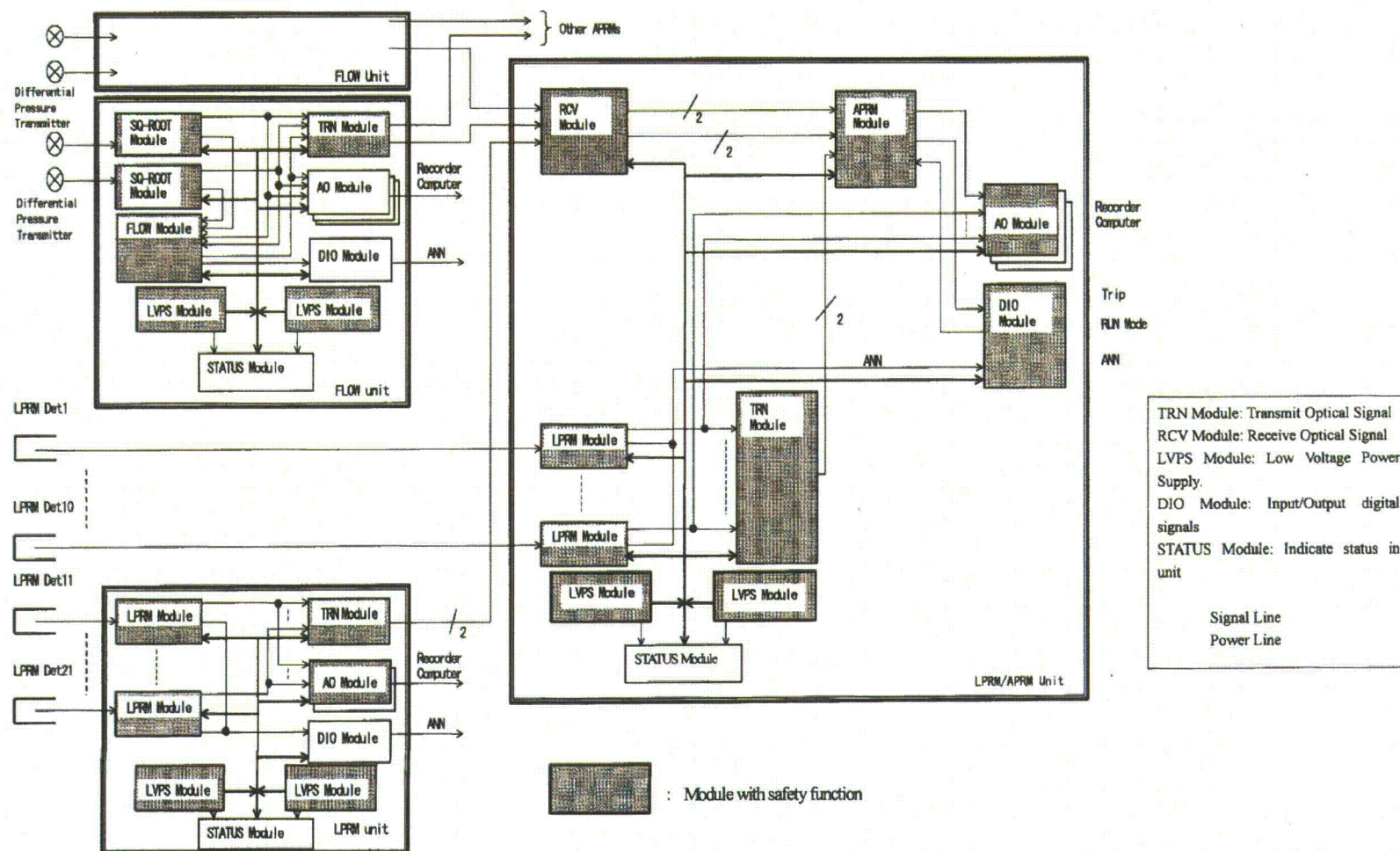
- Sufficiency of Information
 - NRR Office Instruction LIC-109 "Processing Requests for Reviews of TRs" ML091810088
 - Section 3.1.2 states "Determine if there are significant, obvious, problems with the information and analyses provided."
 - Staff found no specific list of qualified components outside defined as the scope of this TR.
 - Staff found no description or analysis of the limitations on how these components may be used.

■ Toshiba Response:

1. Toshiba will add the following contents:
 - Specific list of qualified modules that are in the scope of this TR
 - Description and/or analysis of the limitations on how these components may be used

See the next slides as a sample

Sample (1/3): Module Configuration of PRNM




Sample (2/3): Module List of PRNM

(Slot ID) Module Name	Module Model Number	Functional Description
LPRM Unit (HNU100)		
(FSL01) LPRM Module	HNS013	LPRM function for LPRM Detector CH 11
(FSL02) LPRM Module	HNS013	LPRM function for LPRM Detector CH 12
(FSL03) LPRM Module	HNS013	LPRM function for LPRM Detector CH 13
(FSL04) LPRM Module	HNS013	LPRM function for LPRM Detector CH 14
(FSL05) LPRM Module	HNS013	LPRM function for LPRM Detector CH 15
(FSL06) LPRM Module	HNS013	LPRM function for LPRM Detector CH 16
(FSL07) LPRM Module	HNS013	LPRM function for LPRM Detector CH 17
(FSL08) LPRM Module	HNS013	LPRM function for LPRM Detector CH 18
(FSL09) LPRM Module	HNS013	LPRM function for LPRM Detector CH 19
(FSL10) LPRM Module	HNS013	LPRM function for LPRM Detector CH 20
(FSL11) LPRM Module	HNS013	LPRM function for LPRM Detector CH 21
(FSL12) LPRM Module	HNS013	LPRM function for LPRM Detector CH 22
(FSL13) BLANK Module	HNS490	Dummy LPRM module. When the unit is not filled with 13 LPRM Modules, this module is used to fill the open slots to provide necessary connections and signals simulating the LPRM Module operation in the open slots.
(FSL14) STATUS Module	HNS093	Power-supply-voltage-monitoring status indication
(PSSL01) LVPS Module	HNS500	+5V and ±15V power supply to each module
(BSL01) AO Module	HNS518	Analog output (AO) of LPRM levels (Ch. 11 to 22) to the process computer (0 to +160mV / 0 to 125%).
(BSL02) Blank Panel	---	Blank panel
(BSL03) AO Module	HNS515	Analog output of LPRM levels (Ch. 11 to 22) to the Transient Monitor or OPRM (+1 to +5V / 0 to 125%).
(BSL04) DIO Module	HNS520	Digital Input / Output (DIO) used for digital output of LPRM Upscale, Downscale, and Inoperable signals to the trip auxiliary unit
(BSL05) Blank Panel	---	Blank Panel
(BSL06) Blank Panel	---	Blank Panel
(BSL07) Blank Panel	---	Blank Panel
(BSL08) TRN Module	HNS530	Optical data transmission (TRN) of LPRM level (Ch.11-22). Inoperable and LVPS failure information to LPRM/APRM unit
(PSSL02) LVPS Module	HNS500	+5V and ±15V power supply to each module
LPRM/APRM Unit (HNU200)		
(FSL01) LPRM Module	HNS013	LPRM function for LPRM Detector CH 1
(FSL02) LPRM Module	HNS013	LPRM function for LPRM Detector CH 2
(FSL03) LPRM Module	HNS013	LPRM function for LPRM Detector CH 3
(FSL04) LPRM Module	HNS013	LPRM function for LPRM Detector CH 4
(FSL05) LPRM Module	HNS013	LPRM function for LPRM Detector CH 5
(FSL06) LPRM Module	HNS013	LPRM function for LPRM Detector CH 6
(FSL07) LPRM Module	HNS013	LPRM function for LPRM Detector CH 7
(FSL08) LPRM Module	HNS013	LPRM function for LPRM Detector CH 8
(FSL09) LPRM Module	HNS013	LPRM function for LPRM Detector CH 9
(FSL10) LPRM Module	HNS013	LPRM function for LPRM Detector CH 10
(FSL11) APRM Module	HNS020	APRM function
(FSL13) Blank Panel	---	Blank Panel
(FSL14) STATUS Module	HNS091	Data reception status, power-supply-voltage-monitoring status indications.
(PSSL01) LVPS Module	HNS500	+5V and ±15V power supply to each module

(Slot ID) Module Name	Module Model Number	Functional Description
(BSL01) AO Module	HNS518	Analog outputs of LPRM levels (Ch. 1 to 10), APRM level, APRM Upscale (High) setpoint, Simulated Thermal Power level, and Simulated Thermal Power Upscale setpoint to the process computer (0 to 160mV / 0 to 125%)
(BSL02) AO Module	HNS516	Analog outputs of APRM level and APRM Upscale (High) setpoint to the recorder (0 to +1V / 0 to 125%)
(BSL03) AO Module	HNS515	Analog outputs of LPRM levels (Ch. 1 to 10) and APRM level to the Transient Monitor or OPRM (1 to +5V / 0 to 125%)
(BSL04) DIO Module	HNS520	Digital outputs of LPRM Upscale, Downscale, Inoperable, and APRM trip signals to the trip auxiliary unit Digital inputs of reactor mode and APRM bypass signal
(BSL05) RCV Module	HNS540	Optical data reception of the recirculation flow values from the Flow units Optical data reception of LPRM levels (Ch. 11 to 22). Inoperable, and LVPS failure information from the LPRM unit
(BSL06) Blank Panel	---	Blank panel
(BSL07) Blank Panel	---	Blank panel
(BSL08) TRN Module	HNS530	Optical data transmission of LPRM level (Ch. 1 to 22), APRM level, APRM Upscale (High) setpoint, Simulated Thermal Power level, Simulated Thermal Power Upscale setpoint, and Recirculation Flow values to RBM unit
(PSSL02) LVPS Module	HNS500	+5V and ±15V power supply to each module
FLOW Unit Configuration (HNU300)		
(FSL01) Blank Panel	---	Blank Panel
(FSL02) Blank Panel	---	Blank Panel
(FSL03) Blank Panel	---	Blank Panel
(FSL04) Blank Panel	---	Blank Panel
(FSL05) Blank Panel	---	Blank Panel
(FSL06) Blank Panel	---	Blank Panel
(FSL07) Blank Panel	---	Blank Panel
(FSL08) Blank Panel	---	Blank Panel
(FSL09) Blank Panel	---	Blank Panel
(FSL10) SQ-ROOT Module	HNS030	Square root arithmetic function for Recirculation Loop "a"
(FSL11) SQ-ROOT Module	HNS030	Square root arithmetic function for Recirculation Loop "b"
(FSL12) FLOW Module	HNS040	Recirculation-flow calculation, trip and alarm functions
(FSL14) STATUS Module	HNS093	Flow unit status indication function
(PSSL01) LVPS Module	HNS500	+5V and ±15V power supply to each module
(BSL01) AO Module	HNS518	Analog outputs to the process computer.
(BSL02) AO Module	HNS516	Analog outputs to the recorders.
(BSL03) AO Module	HNS515	Analog outputs to the Transient Monitor.
(BSL04) DIO Module	HNS520	Digital outputs of the trip signals to the trip auxiliary unit. Digital input of Bypass signal.
(BSL05) Blank Panel	---	Blank Panel
(BSL06) Blank Panel	---	Blank Panel
(BSL07) TRN Module	HNS530	Optical serial transmission to RBM unit
(BSL08) TRN Module	HNS530	Optical serial transmission to APRM unit
(PSSL02) LVPS Module	HNS500	+5V and ±15V power supply each module

Sample (3/3): Scope of Qualification

System	Unit	Module							
		I/O function		Communication function		Signal Processing		Power supply	
PRM	LPRM	DIO	HNS520	TRN	HNS530	LPRM	HNS013	LVPS	HNS500
		AO	HNS515			STATUS	HNS093		
	LPRM/APRM	DIO	HNS520	TRN	HNS530	LPRM	HNS013	LVPS	HNS500
		AO	HNS515	RCV	HNS540	APRM	HNS020		
		AO	HNS516						
	FLOW	AO	HNS518						
		DIO	HNS520	TRN	HNS530	SQ-ROOT	HNS030	LVPS	HNS500
		AO	HNS516			FLOW	HNS040		
		AO	HNS517			STATUS	HNS093		
		AO	HNS518						
PRNM for ABWR	LPRM	DIO	HNS520	TRN	HNS530	LPRM	HNS301	LVPS	HNS500
		AO	HNS515	RCV	HNS540	CAL/STATUS	HNS330		
	APRM	DIO	HNS520	TRN	HNS530	APRM	HNS310	LVPS	HNS500
		AO	HNS515	RCV	HNS540	FLOW	HNS320		
OPRM	OPRM	DIO	HNS520	TRN	HNS531	CELL	HNS0400	LVPS	HNS500
				RCV	HNS541	AGRD	HNS0420		
						PBD	HNS0430		
						DAT/ST	HNS0410		
SRNM	SRNM	DIO	HNS520			SRNM	HNS0101	LVPS	HNS505
		AO	HNS516			PARAMETER	HNS0121		
		AO	HNS518			TRIP	HNS0117		
		RM	HNS0550			ST/MON	HNS0131		
		PA	HNS0560			ANALYZER	HNS0140		
						TEST	HNS0151		
RTIS	DTF	DIC1	HNS0730	TRN	HNS530	AITRIP1	HNS1100	LVPS	HNS500
				RCV	HNS540	DTUCA1	HNS1141		
						STR1	HNS1163		
	TLF	DIC1	HNS730	TRN	HNS530	TLUCA1	HNS1152	LVPS	HNS500
		DOC1	HNS740	RCV	HNS540	STR1	HNS1166		
	OLU	LOM1						LLN1	
		LOI1						LHI1	
								LHO1	
SPTM	SPTM							SLD1	
		AO	HNS517	TRN	HNS530	AITRIP	HNS1100	LVPS	HNS500
		DOC1	HNS740	RCV	HNS540	SPTAVE1	HNS1110		
						SPTSEL1	HNS1120		
						STR1	HNS1161		

 Qualified Module

Project Schedule

Project Milestones



(e)

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